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AGRICULTURAL PLANNING

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AGRICULTURAL PLANNING

- USSR -

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## PLANNING OF AGRICULTURAL REGIONS

[Following is the translation of an article by M. Gendel'man and M. Spektor in the Russian-language publication Voprosy Ekonomiki (Problems of Economics), Moscow, No 9, September 1962, pages 127-133.]

In a report to the 22nd Congress of the CPSU, Comrade N. S. Khrushchev, noting the vast levels of capital investment in the national economy in the country, stated: "For such levels it is literally true that a single step cannot be taken without observing the popular saying, 'Seven times you measure off, and one time you cut off.' Here by no means can you manage without the most precise calculations -- which is also true where it is necessary to build, in order to obtain the greatest benefit at the lowest expenditures." The task of the proper location of capital construction objectives is especially pressing for the rayons of the Tselinnyy Kray.

The Tselinnyy Kray is one of the largest granaries of the country, a region of rapidly developing industry. Since 1954 here more than 17 million hectares of new land have been assimilated; 640 large sovkhoses have been created, as well as hundreds of grain-receiving stations; about 2,000 settlements have been built; and thousands of kilometers of railway and highway lines have been constructed. In the current seven-year plan the expenditures for capital construction in the sovkhoses of Tselinnyy Kray will exceed by 150% the outlays for these purposes expended since the time of the assimilation of the virgin lands.

The construction of the farmsteads of the sovkhoses have been carried out until now within the limits of the developing land-use of the farms without sufficient account for the inter-relationship of neighboring farms, and without regard for the specialization and prospect of their development. In this connection, the farmsteads are situated improperly in many sovkhoses, which unfavorably affect their economy.

The December (1959) Plenum of the Central Committee of the CPSU in a resolution obligated the design organizations of the country to begin developing schemes of rayon and intra-farm plans for the agricultural rayons. "These schemes must plan for the prospect of growth and specialization of agricultural production, for the rational location of production and social buildings,

living units, electrification, water supply, road construction and communications, and the further growth of the inhabited points of kolkhozes and sovkhozes."

Under rayon planning is included the organization of the territory of the agricultural economic rayon, in which planning the economic rayon is regarded as a complex of basically agricultural, and also of industrial, power, and other enterprises. The scheme of rayon planning, prepared on the basis of long-term prospects of production and the location of enterprises, plans for the solution of the problem of proper settlement of persons, and of the organization of the network of cultural and welfare services for the population and the engineering equipment of the territory.

In the last two to three years, work has begun in various regions of the country on the planning of agricultural rayons. This work has developed quite broadly in the RSFSR, in the Ukrainian, and the Uzbek union republics. However, it must be said that the scientific establishments have not been prepared to carry out this work, and the design organizations have also begun to work without a scientifically grounded program. In this connection, difficulties have been met in realizing several of the component schemes of rayon planning. Disagreements have arisen in defining the tasks, the content, and the ultimate results of the rayon planning, and the method of organizing the work. This is explained to a substantial extent by the fact that up to the present the theoretical problems of rayon planning have not been developed, and a relationship has not been established between this important complex of studies and other engineering and technical complexes used in agricultural production. Particularly intolerable is the searchlight approach to defining the long-term indices without taking into account the pressing tasks and agriculture in the immediate years to come.

The system of farm management is developed at different times and in various places, such plan and design documents as the long-term plan of growth of the rayon farms, the rayon planning scheme, the design for inter-farm land use, the design for intra-farm land use with an agro-economical substantiation for crop rotation, the planning scheme and design for the establishment of inhabited sites, the land reclamation plan, etc., are prepared. Here it is important to avoid or not to tolerate duplication and excess outlays of time and money. The level of the development of the economy of our country, including also agricultural production, affords the use of not only scientifically substantiated planning for the nearest future, but also a determination of scientific prognosis for the general long run.

In agriculture general planning, as true in industry, must be carried out within the boundaries of the economic rayon. Its purpose and tasks amount to the determination of the volume of

production and to the location of its various branches with the proper combination in the rayon as a whole and in each agricultural enterprise in particular, careful consideration of the natural and economic conditions, a proper location of all objectives of capital construction, and the solution of problems of settling on the territory of the rayon and of each enterprise.

The solution of these tasks in such planning permits simultaneous projection of the general perspective for the organization of the territory of the economic rayon and the engineering equipment of the territory. All this means nothing else but implementation of rayon planning in the broadest sense of the word.

At the very beginning of the work the problem of determining the objectives of rayon planning emerge unavoidably. According to instruction (RSN [?] 01-60 Gosstroy RSFSR /Gosudarstvennoye stroitel'stvo RSFSR; State Construction RSFSR/), rayon planning is conducted within the boundaries of the agricultural administrative rayon. The present administrative agricultural rayon cannot always be the object of rayon planning for two reasons. In the first place, the existing administrative rayon-making has not been economically grounded in several cases and calls for considerable correction; in the second place, every administrative rayon is not a complete economic complex. The external ties of the rayons, the total energy base, the link with industry, and common engineering communications -- all this often gives rise to the need to merge two or more rayons into one economic rayon -- an object of rayon planning. The group of rayons, merged by production administrations created in accordance with the decision of the March (1962) Plenum of the Central Committee of the CPSU is close to the concept of the economic rayon.

In this connection, it is possible that the presently existing administrative rayons will be built up to the levels of territories, by merging the production administration. "The production administrations" said Comrade N. S. Khrushchev, "it appears, will become the basis for the new administrative division of the oblast', kray, and republic."

Following the building up of the rayons several problems must be solved at the inter-rayon level. These problems include: establishment of natural-economic zones, location and specialization of agricultural production, separation of industrial rayons, location of the roads of oblast', republic, and union importance, and of large water reservoirs, main water lines, large irrigation systems, etc. The solution of these problems constitute the main content of oblast' or other inter-rayon planning. The Tselinnyy Kray includes 67 rayons. Their size is characterized by the following data:



Oblasts	Size of administrative rayons (in 1000's of hectares)						
	in total area			in plowland area			Average population size (1000's)
	max	min	average	max	min	average	
Kokchetavskaya	1,397	262	560	529	131	271	35.2
Kustanayskaya	4,505	419	1,095	499	24	338	39.5
Pavlodarskaya	2,891	557	1,130	524	162	329	41.3
Severo-Kazakhstanskaya	705	186	418	461	75	236	45.7
Tselinogradskaya	4,102	298	1,110	655	183	378	38.2

As can be seen from the table, the average size of the rayon in its total area within the kray borders varies from 418,000 to 1,130,000 hectares, and in terms of plow-field area -- from 236,000 to 378,000 hectares. Here, within the same oblast' a sharp variation in rayon size can be observed. For example, in the Kokchetavskaya Oblast' the largest rayon in total area is more than 400% larger than the smallest, and in terms of plow-field area -- 300% larger, in the Kustanayskaya Oblast', the corresponding figures are -- more than 900% larger, more than 2000% larger, in the Pavlodarskaya Oblast' -- almost 400%, and 220% greater, in the North Kazakhstanskaya Oblast' -- 300%, and 520% larger, in the Tselinogradskaya Oblast' -- 13%, and 270% greater. Such a fluctuation in rayon size in many cases is based on differences in natural-climatic as well as economic differences for the territory of the same oblast'. Considerably affecting rayon size is the ratio of agricultural land, the historically formed specialization of agriculture, the presence of industrial centers, the population density, and other factors. For example, the difference in the size of the north (Balkashinskiy and Makinskiy) and south (Barankul'skiy and Kurgal'dzhinskiy) rayons of the Tselinogradskaya Oblast' are justified. The situation in the Kustanayskaya Oblast' is analogous. The north rayons of these two oblasts are situated in the zone of more intense farming. However, their area is somewhat less than the area of the south rayons, and the volume of output in the north rayons is higher than in the south.

However, wholly improper is the sharp disparity in size of agricultural rayons existing for identical natural and economic conditions. Thus, the Atbasarskiy Rayon of the Tselinogradskaya Oblast' in total area is 130% larger and in plow-field area -- 110% larger than the Vishenevskiy Rayon (with the identical ratio of agricultural land), and the Balkashinskiy Rayon of the same Oblast'

is 110% larger than the Makinskiy Rayon. Such rayon dimensions have been formed historically, but economically these differences are not justified.

The rayon size is determined not only by the farmland area, but also by the number of agricultural enterprises, which is an important indicator of rayon size. And according to this indicator sharp variations have been observed. Thus, in the Zerendinskiy Rayon of the Kokchetazskaya Oblast' has three sovkhozes, and in the Ruzayevskiy Rayon of the same Oblast', there are 16 sovkhozes.

According to the population size the rayon dimensions also vary strongly. The Yesil'skiy Rayon, Tselinogradskaya Oblast', is 100% larger in terms of population than the Kiyminskiy Rayon of the same Oblast'; the Ruzayevskiy Rayon, Kokchetazskaya Oblast' is 100% larger than the Leningradskiy Rayon of the same Oblast'; in the Kustanayskaya Oblast', the Semiozernyy Rayon is 300% larger than the Oktyabr'skiy Rayon.

The configuration of the rayon territory has a great effect on how well it can be administered, on the convenience of communication, and on the cultural and welfare services of the population. The configuration of the rayons formed in several cases does not provide these conditions and also is economically completely unjustified. The Rayons of the Tselinogradskaya Oblast' -- Vishnevskiy and Kiyminskiy -- have the same area. However, the extent of the Kiyminskiy Rayon from north to south is 180 km, from west to east -- 30 km, but the Vishnevskiy Rayon in its configuration is close to a circle with a radius of 45 km. Many rayon centers are situated at the margins of the territory in question. Such rayons include the Makinskiy and Leninskiy, Tselinogradskaya Oblast', the Bulayevskiy and Leninskiy, North Kazakhstanskaya Oblast', the Ruzayevskiy Rayon, Kokchetazskaya Oblast', etc.

Frequently, the territory of the same rayons are wedged into each other, and the administrative jurisdiction of the farms is also improperly determined. The Chulaksandykskiy Sovkhoz of the Tselinogradskaya Oblast' is situated 40 km from the rayon center -- the settlement Yesil', and 80 km from the other rayon centers -- the village of Derzhavinskoye. However, this sovkhoz is subordinated to the Barankul'skiy, and not to the Yesil'skiy Rayon. At the same time, the Zapadnyy Sovkhoz is situated 110 km from the rayon center -- the settlement of Yesil, and 35 km from the other rayon center -- the village of Derzhavinskoye, but is under the jurisdiction of Yesil'skiy Rayon. The Kievskiy and the imeni Ostrovskiy Sovkhozes are found 25 km from the rayon center of the Kiyminskiy Rayon -- the station of Dzhaksa, and 70 km from the station of Atbasar. Although the territory of the Atbasarskiy Rayon is somewhat larger than the Kiyminskiy, both of these farms are under the jurisdiction of the Atbasarskiy Rayon. The examples presented evidence the need to introduce substantial corrections into the administrative division of rayons.

From what has been said it also follows that the strengthening of rayons must be carried out through the simple merger of two, three, or more rayons into one. With such an approach many of the shortcomings pointed to would not be eliminated. Needed is a careful examination of the boundaries formed and the rayon dimensions, economic and transportation ties, the power base, the size and location of inhabited places, and the possibility of using the largest of these as rayon centers. Only on the basis of the study of all these conditions can an economically substantiated rayon division be carried out. The resulting rayons formed will be close to the economic rayons and will be an object of rayon planning.

The content of the entire complex of work relative to the conditions of the Tselinnyy Kray must be reduced to the natural-economic zoning of the oblast' territory with regard given to the prospects of development and location of industrial centers and rayons, transportation networks, power bases, etc.; taking into account the determination of the specialization and location of branches of agriculture, determination of the optimum sizes of agricultural enterprises according to zones; establishment of the sizes and boundaries of rayons and rayon centers on the long-term basis; delineation of rayon groups within the borders of natural-economic zones and the determination of the boundaries of economic agricultural rayons; and the conducting of rayon and intra-farm planning for each economic agricultural rayon.

\* \* \*

Rayon planning must be carried out according to three successive stages. At the first stage, the work consists of an economic hypothesis of the growth of the rayon for the long-run prospects. At the second stage, intra-farm planning of all agricultural enterprises of the rayon within the new boundaries will be carried out. At the third stage the final scheme of rayon planning will be prepared.

During the first and second stages mainly to be solved will be tasks of specialization and location of agricultural production in the rayon through micro-zoning, as well as the solution of the problem of use and allocation of the land fund, problems of the re-ordering of land use practices and the elimination of its shortcomings, for which, during the second stage, the prospects of growth of the inhabited places will be elaborated, the location of prospective inhabited sites are to be established, as well as the determination of the roads and the order of their rational construction.

General planning is carried out only as a scientific prognosis over the 20-year long-run. Here, several of its elements are solved more precisely by bringing them down to specific territories. Such elements are the boundaries of agricultural enterprises and the location of inhabited sites.

The scheme of rayon planning, affording solution of the task of location and specialization of agricultural production, and also

the determination of the volume of production for the proper combination of branches, includes a system of farm management for each specific enterprise and for the rayon as a whole. Calculations for the production of all kinds of agricultural products are based on the recommendations of the system of farm managements (the system of farming and the system of animal husbandry) for the given zone. Such recommendations must be developed for each oblast' and for the individual micro-zones within the oblast'.

On the basis of the rayon planning schemes the long-run plans and engineering designs must be developed for a shorter period (five-, seven-, ten-years). These include the plans for inter-farm and intra-farm land use, plans for the construction of inhabited sites in succession, land reclamation plans, etc.

Land use is the most important component and individual farm planning. However, it has three characteristics in terms of planning:

a) Plan period. Experience shows that the land-use forms of the organization of territory that have been created, especially within the farm, are being steadily improved and call for systematic corrections in connection with new national-economy tasks, in particular, tasks for the growth of agricultural production. Therefore, the period for which the land-use plans are prepared usually does not exceed five to ten years. In land-use practice in recent years more often the need has arisen for two plans -- for the transitional period and for the long-run, especially since the transformation of land is possible only through the use of land reclamation. In these cases, the land-use plan prepared with consideration for the assimilation of new lands cannot be left to nature; mastery of the land is inconceivable without expensive land reclamation operations. The scheme of rayon and intra-farm planning can serve as a basis for the development of two, three, and even more plans of intra-farm land-use, prepared for shorter periods.

b) Precision of technical specifications and economic substantiation. The scheme of rayon and intra-farm planning is not turned over to nature. It is a single-stage project, remaining at the draft stage, and is not brought up to the technical plan level. There is no necessity for this. Nothing of what must be accomplished in 15-20 years would be well preserved by nature. The two-stage plan of land use, brought to the stage of a technical plan, following preparation of working sketches is turned over to nature with geodesic precision and is forthwith assimilated.

c) Content and volume of work. Rayon planning, along with inter-farm land use, additionally includes several components and elements which are wholly or partly unenvisaged in the plan of inter-farm land use (location of engineering communications, the network of cultural and welfare services, etc.). Intra-farm planning includes part of the elements constituting the content of intra-farm land use (location of divisions, farmstead centers, main highways, and transformation of lands). However, it excludes elements of internal use

of the territory, crop rotation, and land. At the same time both intra-farm as well as rayon planning includes elements not envisaged by the plan of intra-farm land use (determination of means and priority of building construction, the zoning of the territory of the inhabited places, etc.).

Consequently, rayon and intra-farm planning have many similarities in land use, but differ from land use planning by important specific features.

The concept of intra-farm planning should never be confused with the concept of the planning of rural inhabited places. As a result of intra-farm planning only the location of the inhabited sites on the long term basis are established and the priority of buildings, the basis for the priority, and the zoning of territory are developed. The task of planning inhabited sites consists of the internal use of the territory within the selected areas or the redesigning of the existing inhabited sites, creation of the necessary architectural and planning composition, and provision of normal conditions for the existence and welfare of the population. The scheme of rayon and intra-farm planning is the basis for preparing the designs for planning the erection of inhabited sites.

The detailed plan of construction including the turning over to nature and the linking up of the construction objectives must be prepared by the time of the first stage of the construction, portions of the territory intended for construction during the second and subsequent stages must be planned for in detail for a later period. The linking up of the construction objectives and the turning over to nature of the blocks or living quarters, using geodesic method, and the street network for the territory during the second and subsequent stages of construction is of no economic sense whatever.

What has been said on the land-use and planning designs refers also to designs of land reclamation. The basis for their preparation is the scheme of assimilation of new land and the transformation of existing worked land, which scheme is the most important part of the overall scheme of rayon and intra-farm planning. In terms of detail, the design must be prepared for that part of the territory within whose limits land reclamation measures are planned to be carried out within the immediate future.

The ratios of long-term planning to engineering designing and the inter-relationships of planning and land use can be illustrated by the following example.

The Department of Land Use and Inhabited Places of the Tselinogradskiy Agricultural Institute is completing work on rayon planning for the Yesil'skiy Rayon, Tselinogradskaya Oblast'. The basic positions of the hypothesis of rayon development, proved by the Yesil'skiy Rayon Party Committee and by the Rayon Executive Committee have already begun to be put into practice. Thus, with the liquidation of the agricultural Rassvet Artel' in 1961, the plan of inter-farm land use was prepared and put into practice on the basis of data of the economic hypothesis.

Work on the Yesil'skiy Rayon has been carried out in the following order. During the first stage an economic hypothesis for rayon growth was prepared, in which the following problems were solved: micro-rayons were allocated out of the rayon territory according to natural-economic conditions; the prospects for the increase in agricultural specialization were determined both for the entire rayon and for its micro-rayons; the optimum dimensions of agricultural enterprises and economic subdivisions were determined; the number and size of new agricultural enterprises were established, and their limits planned; inhabited places were outlined as central country seats of new agricultural enterprises; and a long-run determination of the location of enterprises of local industrial centers, of large water-economy, and other engineering structures, as well as inhabited places, were determined.

In accordance with the natural-economic conditions, two micro-rayons were formed on the rayon territory -- a left-bank and a right-bank (in relation to the Ishim River). The rayon specializes in grain production. Over the long run a sharp increase in animal husbandry output is scheduled.

Based on an analysis of the results of economic activity of the sovkhoses of the Kray and using special calculations, the following optimum dimensions were adopted: 20,000-30,000 hectares of plow-field land for sovkhoses with the representation of plow-fields varying from 50 to 70%, and 30,000-40,000 hectares for sovkhoses whose plow-field weight ranges from 70 to 90%. For the rayon, instead of 21 farms, 17 are planned. In designing, the central country seats of the new sovkhoses were outlined in advance.

The further solution of problems of rayon planning is linked with intra-farm planning. In carrying out inter-farm planning, of vital importance is a determination of the optimum dimensions of economic subdivisions. Through the use of the variation-estimate method, the optimum size for a division of 8,000-10,000 hectares of plow-field land was adopted for the sovkhoses of the Yesil'skiy Rayon. On this basis, 57 divisions are scheduled to be organized in 17 farms of the rayon, that is, three to four divisions for each farm.

In determining the production levels in the economic subdivisions, especial attention has been given to the formation of large inhabited sites. The size of inhabited places, according to our estimates, will vary from 800 to 1,500 persons. Such dimensions, as shown by the theory and practice of city planning, will afford the creation of the necessary cultural and welfare conditions for the population.

Lying at the basis of a solution of the problem dealing with specialization and concentration of production in divisions have been the requirements for maximum use of all agricultural land and an increase in labor productivity along with a reduction in product cost. No more than two kinds of animals are located in the divisions: young steers and hogs, young steers and chickens, fattened

young steers of large-horned cattle and sheep. Completion of work on intra-farm planning coincided with the beginning of work on the planning of inhabited places over the territory of the rayon. The schemes of intra-farm planning prepared during the process of rayon planning lay at the basis of the designs worked up for the planning of rural inhabited sites.

In the final scheme of rayon planning, the results of intra-farm planning are summed up and the prospects for a rise in rayon agricultural output are refined; the industrial enterprises dealing with the processing of agricultural products are located; the overall use of water resources is outlined; the main objectives of cultural and welfare services, public health, and education are located; the formation of a repair base in the rayon is designed; the volume of construction operations is determined, and enterprises dealing with the production of building materials and parts are located; a network of electricity supply, introduction of heating and gas supply systems for the inhabited places are outlined; and the volume of road building and the organization of transport are established.

In view of the fact that the scheme of rayon planning is the basis for engineering designs, the measures envisaged by the land reclamation scheme for the immediate five to seven years must be developed with a higher degree of detail and completion than measures outlined for the longer run. Proposals on the dimensions and boundaries of agricultural enterprises and their economic subdivisions, the transformation of arable land, the location of inhabited places, the organization of animal husbandry farms, and the location of other production centers whose construction is planned for the first stage must be developed in the greatest detail. And all of the elements enumerated which are most detailed and economically substantiated can be resolved only in special engineering plans when preliminary special engineering inquiries are carried out. Thus, in the Zarechnyy Sovkhoz, Yesil'skiy Rayon, not all these suggestions on locations outlined in the process of preparing the general scheme of intra-farm planning of the sovkhos can be implemented in the immediate future. Especially difficult is the organization of the country seat of the fourth division due to the lack of water. The organization of water supply to this country seat is possible only through the building of canals to supply water to the arid sovkhoses, however, this construction according to the existing data does not affect the sovkhoses of the Yesil'skiy Rayon. Creation of the country seat of the fourth division, as well as of other country seats of sovkhoses in waterless locations of the Yesil'skiy Rayon are related only to the next five-year plan. Construction of the country seat of the first division, and of the second, on the basis of the railway station also requires considerable capital investments for water supply organization.

Stemming from the foregoing is the need to prepare, on the basis of intra-farm planning, two or three designs of intra-farm land use. The first designs can entail the outlining of organization

for no more than three divisions. Only the following design of intra-farm land use, which will be prepared after 1970, envisages the organization of four divisions.

The example presented is an illustration of the theoretical positions stated above dealing with differences in general intra-farm planning and with intra-farm land use designed for the immediate future.

As far as organizational problems are concerned, all work on planning, as we see it, must be carried out in close association with design organizations, scientific research institutes, departments of higher educational establishments, and with specialists of oblast', inter-rayon, and rayon organizations, and with individual enterprises. It is advisable, in kray and oblast' executive committees of workers' deputations, to form permanent commissions of specialists headed by the vice chairmen of the executive committee. Analogous commissions must be formed, when work is carried out on rayon planning, in the rayon executive committees and the inter-rayon production administrations.

Mass construction at central country seats of divisions call for the maximum speedup of design work. At present, work has been considerably expanded in planning for rural inhabited places. Large design institutes of the country have been given orders to prepare designs for the planning of hundreds of sovkhoses of the Tselinnyy Kray.

The main questions of planning within the borders of the oblast' must be examined, after which work will be done on rayon planning (embracing the maximum possible number of rayons) and the preparation of preliminary schemes (economic hypotheses) will be commenced. This will permit work on rayon and intra-farm planning, and also on the planning of inhabited places in close coordination and assure the proper location of construction objectives. The final resolution of the scheme of rayon planning must be completed by the time working sketches are set out for the planning of inhabited places. Such an organization of work makes possible the avoidance of several gross economic errors.



## ECONOMIC BASES OF RATIONAL UTILIZATION OF FERTILIZER

Following is the translation of an article by Z. Kanskaya in the Russian-language publication Voprosy Ekonomiki (Problems of Economics), Moscow, No 9, September 1962, pages 151-155.

A conference organized by the Ministry of Agriculture USSR and by the All-Union Scientific Research Institute of Fertilizers and Agropedology (VIUA /Vsesoyuznyy Nauchnoissledovatel'skiy Institut Udobreniy i Agropochvovedeniya/) in Moscow. Along with a discussion of the problem of raising the efficiency of the fertilizer use, many papers and reports included detailed economic substantiation and calculations. They permitted a fuller determination of how effectively certain forms of fertilizer have been used, as well as the norms and methods of their administration under the conditions of various soil-climatic zones of the country.

Opening the conference, the Acting Director of the VIUA, I. Mamchenkov, emphasized that the task of increasing the harvest yield of agricultural crops for many rayons of the country is intimately related to fertilizer production. A sharp increase in their production and use constitutes great and demanding tasks for both agrochemical and economic science. The most important of these tasks are as follows:

- the preparation of agriculture to receive a vast stream of mineral fertilizers and the elaboration of a scientifically grounded system of measures for transport, storage, preparation (mixing), and application of mineral fertilizers, the elimination of losses, and mechanization;

- the development and improvement of scientifically substantiated methods of determining agricultural needs for fertilizers and fertilizer allocation by crops and economic rayons of the country taking into account soil and climatic conditions;

- the development of methods of recording the economic effectiveness of organic and mineral fertilizers, and also of a system for their use in intertilled crop rotation, assuring the maximum effective use of land and an increase in its fertility;

- improvement of the existing and the development of new and more effective methods of using organic fertilizers;

- overall mechanization of the application of organic and mineral fertilizers;

determination of methods of affecting the quality of agricultural products through the use of fertilizers.

Read at the conference were papers on three basic problems: agro-economic effectiveness of mineral fertilizer use by crops and natural-economic zones of the country; new effective forms of mineral fertilizers; and the results of experimental work on fertilizer use for intertilled and grain-pod crops, and also results of rational procedures and methods for mineral fertilizer use in the eastern rayons of the country and in the rayons of irrigated farming.

P. Naydin (VIUA) in his paper spoke of the tasks of the new policy in the chemization of agriculture caused by a change in the structure of planting areas and by the need for better use of land. In this connection, the mineral fertilizer needs of agriculture for 1965 are determined as approximately 45 million to 47 million tons; industry will supply 31 million tons, of which 2.5 million tons will be used for forage production in animal husbandry. Such a turning point calls for a very economically and well substantiated allocation of fertilizer according to zones and original rayons of the country. The speaker emphasized the need for further changes in the ratios of nitrogen and phosphorus fertilizer in favor of the former.

For the best zonal study of the effectiveness of fertilizers, Comrad Naydin suggested that experiments be conducted on a broader scale, especially in new rayons, on the irrigated lands of the Volga region and Kazakhstan, where in regard to irrigation the need for phosphates has been reduced, and the nitrogen requirements have been sharply increased. In his opinion, in the immediate future a certain reduction in the supply of phosphates used for sugar beets and cotton must be carried out in order to use this fertilizer type for grain crops. Even in 1963 a supply amounting to not less than 1.5 million tons of granulated superphosphate for thorough application for grain crops must be created, which will yield high economic gain. Important in this connection is the use of optimum doses of fertilizer, which must assure the production of the planned harvests with the most progressive means of fertilizer application and the smallest expenditures.

Another important problem is the development of the most economical methods of fertilizer application. In particular, the Soyuzsel'khoshtekhnika [?] must make available for this purpose the sale of the SU-24 seeders to the kolkhozes. Granulated superphosphate must not be applied for soil dressing from airplanes or be introduced in manure-earth and other composts. Also impermissible is the shipment of granulated superphosphate in bulk, as is done sometimes in the Ukraine. Also requiring change is the practice of applying potassium and phosphate fertilizer by stages, reserving the main portion of the operations from spring into autumn. Top-dressing, according to the speaker's opinion, ". . . is essentially nothing else but extravagance, and it must be sharply

curtailed!" Economically justified and progressive is the combination of mineral fertilizers with organic. However, the approach toward carrying this out must be differentiated. On serozem soils, for example, the use of mineral fertilizers in the pure state yields no less, and sometimes more, than what is obtained with the use of manure at levels that are equivalent in terms of nutrient content.

Manure is more conveniently applied on the fields closest to its sources of accumulation, and mainly for corn and potatoes. Phosphorus and potassium fertilizers are more advisably used on those fields where manure is applied. All these problems call for further serious economic study and analysis.

Academician of the All-Union Academy of Agricultural Sciences imeni V. I. Lenin devoted his contribution to the production of new forms of mineral fertilizer. He noted that in addition to increasing the quantity of mineral fertilizers, vital economic importance also lies in what kinds and forms these fertilizers will take. Thus, in the current seven-year plan, in addition to potassium chloride fertilizers the output of nonchloride forms will be begun. The essential role in this regard is played by the aluminum industry, which will produce as secondary products potash, potassium sulphate, and potassium-magnesium sulphate.

In the very near future, the low-percentage potassium salts will increase in importance in the array of potassium fertilizers, these salts must be most effectively utilized. In the production of phosphorus fertilizers, the main direction lies in the output of high-concentrated forms -- basically the double superphosphate. On the basis of phosphorous iron ores in the south of the European part of the USSR and in the East (in Western Siberia and Kazakhstan) a large quantity of phosphate slag will be produced. Also increasing is the use of phosphorite powder, through the initiation of exploitation of new phosphorite deposits. The use of phosphorites for the production of high-content fertilizers is planned to be accomplished through the electrothermic method.

An ever increasing place in the variety of nitrogen fertilizers will be gained by urea. In the US, urea nitrogen is 20% cheaper than the nitrogen of ammonium nitrate. The task of our nitrogen industry lies in producing urea with the same cost per unit nitrogen as for ammonium nitrate. In addition to this, it is necessary also to find methods for containing the urea nitrogen in the soil, excluding the possibility of its loss (according to the data of American researchers, up to 25%). The use of ammonium chloride, which will be produced by the soda industry of the Donbass, in the speaker's opinion, will be limited to the zone of chernozem soils.

An important task of the institutes and experimental stations is the development of the best methods for introducing cheap liquid nitrogen fertilizers. By 1965, such fertilizers will represent 10% of the total nitrogen fertilizer demand. As demonstrated by practice, the most economical use of aqueous ammonia for its

fall application under plantings of winter crops and for fall plowing. The main regions for aqueous ammonia use will be the following oblasts: Moskovskaya, Tul'skaya, Kaluzhskaya, Ryazanskaya, Smolenskaya, Kalininskaya, Kurskaya, Voronezhskaya, Lipetskaya, Irkutskaya, and several others, and also the Ukrainian SSR (especially the right-bank oblasts), the Lithuanian SSR, and others.

P. Baranov regards the use of aqueous ammonia for the preparation of peat-ammoniacal and peat-ammoniacal-mineral fertilizers to be economically advisable due to their poor transportability and relatively small effect of peat use.

A. Vyshinskiy (Ukrainian Institute of Agricultural) reported on the effective use of ammonia water and the rapid increase in its application in the Ukraine, especially in the Poles'ye (vast alluvial plain). In 1962, ammonia water was introduced into the Ukrainian SSR over an area of 60,000 hectares, and by 1970 more than 3.5 million hectares of planting will be fertilized. The high effectiveness of ammonia water use has been attained by using it for corn, each centner of fertilizer yields an addition of about 40 centners of standing corn. Here, the quality of the corn has been improved, the percent of crude protein content has been increased, and maturing speeded up by four to five days sooner. The preparation and use of peat-mineral and peat-ammoniacal fertilizers, especially in the Poles'ye zone, directly at the farms for when the fertilizer is moved from place of preparation to that of application over a distance of 15 up to 20 km, Comrade Vyshinskiy regarded as economically entirely justified.

The use of peat-ammonia mixture for potatoes permits an increase in the yield of 10-12 centners more than with the use of peat and ammonia water administered separately. Peat-ammonia fertilizers are economic interest because they reduce the storage demands of ammonia water.

The contribution of A. Zemite (Latvian Institute of Agriculture) was devoted to the effectiveness of trace-fertilizer use. Good results have been obtained in mineral soils by manganese, molybdenum, and boron, and copper -- in peat soil. Much depends also on the methods of their administration (spraying, soaking /zamachivaniye/, or dressing of seed). Various varieties of the same species of plant respond differently to these procedures. The effect of trace fertilizer use amounts not only to a quantitative increase in the harvest, but the quality of the produce is also raised, and the sugar, starch, and carotene content are also increased. The use of trace elements also is of positive value in combatting several plant diseases, for example, fusariosis.

The general conclusion from the paper is as follows: trace elements have an economic effect only when they are not contained in the soil solution in the amount needed by the plant. Therefore, their use calls for good preliminary soil study.

The highest indices of productivity of the sugar beet (increase in harvest yield and saccharinity), as shown by Ye. Tonkal' (All-Union Scientific Research Institute of Sugar Beets), have been attained with the combination of organic and mineral fertilizers. However, the addition of manure to knowingly high doses of mineral fertilizers leads to a decrease in the saccharinity of beets and to a relative drop in the effectiveness of organic fertilizers. The speaker regards as inadequate the 1965 planned increase of 9.5 centners per hectare for sugar beets (factory), when mineral fertilizers are used, and 5.5 centners with the same fertilizers used for beets grown as cattle feed. He presented the problem of the need to apply additionally to this crop up to 20 tons of manure per hectare, apparently. This will make possible a harvest yield increase of up to 31 centners.

With this increase, the added gain in additional beet harvest yield above the added expenditures will amount to 42 rubles 70 kopecks per one hectare. The speaker noted the positive economic effect to be gained from the administration of organo-mineral mixtures when growing sugar beets in most beet-planting rayons. Also effective is the use of humate of ammonia.

P. Dmitriyenko (Ukrainian Institute of Agriculture) reported that, based on numerous experimental data, the single time application of the entire fertilizer norm does not fall behind, but outdoes the results of a fractional administration of the same amount of fertilizer. This economizes outlays in labor and material means in the total outlays for fertilizer use. Postponing work in applying potassium, phosphorus, and also complete mineral fertilizers from autumn to spring and soil dressing reduces the effectiveness of fertilizers (except for the cases of nitrogen fertilizer used for applying soil dressing under winter crops). A positive effect from soil dressing is attained only when it is done with additional and not with the main fertilizer.

Data of the experiments also showed that with an unchanged level of agrotechniques, the rise in harvest yield is not proportional to the increase in fertilizer norms. Here a decrease in the returns per unit fertilizer of agriculture crop produce takes place, and in several cases the additional application of fertilizer does not add to the harvest yield. The long standing opinion on the advantages of frequent and fractional administration of fertilizer is regarded by the speaker as illusory; the advisability of soil dressing, in his opinion, can be based only on economic considerations.

A. Barayev (All-Union Institute of Grains) illuminated in detail the problem of the factors involved in the effective use of mineral fertilizers in the eastern regions of the country. Further increase in the production of grains in the Tselinnyy Kray, the speaker noted, will be obtained through the use of fertilizer, in the first place, of phosphorus fertilizers, which simultaneously promote a speedup in maturity and rapidly pay for

themselves. As a result of the administration of superphosphate under vernalized wheat, the experimental farm of the Institute of Grains obtained in 1961 over an area of 509 hectares 20,500 rubles of net profit. The net profit per one hectare of wheat, using broadcast application of 3.5 centners of superphosphate amounted to 25-30 rubles, or 7.1-8.6 rubles for each centner of solid fertilizer, and with the furrow application of 0.5 centners of superphosphate -- 6.3 rubles per hectare or 12.6 rubles per centner of solid fertilizer.

The presence in Kazakhstan of phosphorite deposits will permit even in the immediate future the solution of the problem of applying phosphorus fertilizers under grain crops. Trace elements yield a marked effect with vernalized wheat: copper, boron, and manganese. Great economic interest lies in the combination of studies on spraying of herbicides to eliminate weeds and extra forage top dressing.

The speaker regarded as most expedient the use of manure for irrigated sections planted with vegetable and fruit-berry crops, and also with potatoes and cabbages. One ton of manure, applied under vernalized wheat, according to his calculations, will yield additionally 11.8 fodder units, for potatoes -- 40.5, for corn -- 35.2, and for early cabbage -- 139 fodder units. The gain in the form of additional produce from the application of one ton of manure in growing vegetables is 70 times higher than for vernalized wheat.

A. Kurtesov (Altay Scientific Research Institute of Agriculture) reported that on the chernozem soils of the Altay the best form of fertilizer is the organo-mineral mixtures composed of manure or humus and superphosphate or manure-phosphorite compost, whose use permits the production of grain harvest yields of 44-48 centners per hectare, and of green corn mass for silage -- 630-740 centners per hectare, and also high yields of potatoes and vegetables. Under the Altayskiy Kray conditions, until recently manure was used very limitedly in fertilization. Due to this, great reserves of humus-sypets [pulverized material] were accumulated, which in mixture with superphosphate must be effectively used for fertilization. The composting of manure with phosphorite powder has revealed the bright promise for phosphorite use of the karst deposits of the Altayskiy Kray. The use of the karst deposits of the Gornaya Shoriya, whose preserves amount to 40 million tons of phosphorites, will supply the phosphorus fertilizer needs of all the oblasts of Western Siberia and the Altayskiy Kray for approximately 80 years.

An essential source for cheap nitrogen in the deep-plowing system of agriculture are the legume crops -- beans and peas. Along with organo-mineral fertilizers, they substantially reduce the mineral nitrogen solid fertilizer needs. The place of the crops in the near future will increase in the kray to 10-12% of the planted area.

T. Kochergin (Siberian Scientific Research Institute of Agriculture) in his contribution criticized the position of V. R. Vil'yams on the application of mineral fertilizers only in conjunction with organic fertilizers, considering this to be unfounded for the conditions of Siberia. For a distance of fields amounting to 10-15 km from the manure accumulations, hauling requires great expenditures and its use in this case will be of low effect compared with small doses of mineral fertilizers. The speaker also formulated his conclusions: when the task to obtain the highest harvest yield and the highest per hectare addition to the harvest is involved, then mineral fertilizers must be used together with organic, and when it is necessary to have the largest return on fertilizers in terms of harvest increases and the highest yield of produce in the farm, then it is advisable to use organic and mineral fertilizers separately over the larger area of planting (this is especially important for fertilizer shortages).

In the Omskaya and Tyumenskaya Oblasts, natural organo-mineral mixtures -- peat-vivianites  $[Fe_3P_2O_8 - 8H_2O]$  -- have been effectively used for fertilization. Also tried and positively appraised as a fertilizer or as raw material for fertilizer preparation are the wastes from the petroleum refining and metallurgical industries.

B. Sushenitsa (Tadzhik Scientific Research Institute of Agriculture) directed attention toward the high effectiveness of using for cotton a high-concentrate, complex nitrogen-phosphorus fertilizer -- ammophos. Its economic effectiveness increases somewhat further if it is considered that in the cotton-planting regions more than 70% of mineral fertilizers are used in the form of mechanical mixtures, whose screening and mixing is associated with sizable labor outlays.

Even more effective forms of phosphorus fertilizers for cotton, according to the opinion of N. Zelenin (All-Union Scientific Research Institute of Cotton-Growing), are the following: ammoniated superphosphate and precipitate, prepared from the Kara-Tau phosphorites. However, he believes that ammoniated superphosphate in the future will be replaced by double ammoniated superphosphate as a more concentrated and transportable fertilizer. The high economic effectiveness and rapid (in two to three years) recoupment of expenditures for plant construction make advisable an increase in the output of such fertilizers as precipitate, double ammoniated superphosphate, and ammophos.

In order to avoid large expenditures in manufacturing solid fertilizer mixtures in the farms, the preparation of mixed and complex fertilizers needs to be organized under plant conditions. It is known, for example, that plant mixtures in the US, Great Britain, France, and the FRG represent 50-75% of the total quantity of fertilizers.

Of exceptional importance, as noted in his contribution by P. Kiselev (Scientific Research Institute of Agriculture of the

South-East), are fertilizers used to obtain high harvest yields of irrigated crops. Moderate additions to the harvest by means of fertilizers here are as follows: wheat -- 10-12 centners, corn -- 15-20 centners, and sugar beets -- 100-120 centners.

N. Mikhaylov (VIUA) reported on the nature of the use of mineral fertilizers according to the main natural-economic zones of the country in the immediate future. In the current seven-year plan, organic fertilizers will mainly be used, and the quantity of mineral fertilizers which agriculture will receive must be viewed as an addition to the supply of organic fertilizers. The speaker noted that in the allocation of fertilizers over the immediate long-run according to regions and zones, the first-priority supply of the republics of Central Asia and the Transcaucasus is planned, where the most valuable commercial crops are concentrated -- cotton, tea, etc. The remaining quantity of fertilizers is concentrated where their use will result in the highest and most stable effect. Such regions are as follows: the north of the RSFSR, the nonchernozem belt, the Baltic republics, Belorussia, the Poles'ye, and the northern rayons of the Ukraine, and, of course, the steppe rayons. Within individual zones the main crops to be fertilized will be the most intensive plowed crops: sugar beets, corn, fodder beans, potatoes, and also flax and winter grains.

With the limitations on mineral fertilizers, a progressive method yielding the largest effect over the largest possible area with relatively low outlays of fertilizer per one hectare is the row use of fertilizers. For the steppe chernozem regions, it is wholly adequate to apply only one row fertilization in order to obtain over a long period high and stable yields of grain and other crops.

N. Baranov (VIUA) contributed a special paper on the economic effectiveness of mineral fertilizer use according to zones and crops. He presented the following data: by 1970 the USSR will produce 77 million tons of fertilizer and attain by 1965 the present level of the US for amount of fertilizer per one hectare of plowland. However, it must be kept in mind that our agriculture has available to it greater possibilities for the effective use of fertilizer than the capitalist countries, by virtue of the advantages of the socialist system of agriculture. Therefore, it is very important that the effectiveness of fertilizer use in agricultural, soil-geographic, and economic regions be systematically studied both by a network of experimental establishments, as well as under production conditions. This can be done best in farms that have a rational organization of labor, proper use of land and production facilities, and with a responsible and careful accounting of all cost elements.

The following must result ultimately from the agro-economic research: a comparative evaluation of the various forms of fertilizers, development of rational and economically substantiated norms for their application taking into account natural fertility



and the productive capacity of the soils, the establishment of the best periods and methods of applying various forms of fertilizer, the combination of mineral and organic fertilizers in a system of fertilization, and also the use of trace elements and growth stimulators, the combination of fertilizers with advanced agrotechnical procedures and, finally, a more rational allocation of fertilizers and fertilizer use according to zones and crops.

The allocation of fertilizers according to the zones of the country and their use according to various crops has thusfar proceeded nonuniformly. With the high level of fertilizer supply to the leading technical crops, the foodstuff group of crops, especially the grain, have been allocated an extremely inadequate quantity of fertilizer. The amount of mineral fertilizers used per hectare of plowland for individual, and even mixed, zones varies highly. In the RSFSR, less than one-half as much mineral fertilizers are used per hectare of plowland than in the Ukrainian SSR, one-sixth as much as in the Belorussian SSR, and one-eleventh as much as in the Baltic republics. An increase in the production of industrial fertilizers will permit the equalization to a greater extent of fertilizer requirements according to individual zones and economic rayons of the country.

A most important problem in the effective use of mineral fertilizers is the determination of substantiated optimum norms and doses of fertilizer application according to crops, the securing of a given level of harvest yield at the highest return per unit fertilizer and expense. It is time that the norms of fertilizer use for cotton, sugar beets, tea, citrus, and to a lesser extent for flax, hemp, tobacco, majorca, oil-bearing and volatile oil-bearing crops must be thoroughly studied.

In relation to several changes (system of fertilizers, etc.), the norms of application call for reexamination and refinement.

In addition to the method of geographic field tests in establishing norms and doses, other methods of studying the economic fertility of soils must be broadly utilized as well, in particular, the method of technical estimates of fertilizer dosages based on an agro-economic evaluation of soils, which is being developed at present. Also calling for broad application is the method of correlation of data on reserves of usable nutrients in various soils and the action of fertilizers on harvests. Further increase in fertilizer norms for such crops as cotton and sugar beets must be carried out in a differentiated manner, taking into account the soil-climatic conditions of individual regions with the corresponding further increase in the level of agrotechniques and selection, and the introduction of more effective methods for fertilizer use.

Economic effectiveness stemming from the fertilization of crops even of homogeneous groups differs essentially within individual zones. The use of a complete mineral fertilizer for corn going into silage in the nonchernozem belt yields about 73 rubles of provisionally clear profit per one hectare at a level of profitability of expenses in fertilization of 260%, and for winter and

vernalized wheat -- about 34 rubles per one hectare with a profitability of 130%. The return of one ton of fertilizers applied under corn going into silage at a fertilizer norm of 4.5 centners per one hectare amounts to 76 rubles, and for winter grains at a norm of 5 centners per one hectare -- to 50 rubles, that is the return per unit fertilizer for corn is 50% than for winter grain crops.

For the most economical use of fertilizers directly on the farm, of essential significance is the relative economic effectiveness of their use for individual crops, expressed in terms of profitability of expenditures and value of the provisionally net profit obtained per unit area or per unit of effective agent.

The level of economic effectiveness of mineral fertilizer use for individual crops depends on the most advisable selection of the kinds of fertilizers, and on the doses and methods of their application. Thus, the level of profitability of applying 0.5 centners of granulated superphosphate in rows for winter wheat is 180% than the use of one centner of nitrogen fertilizer used as top dressing for the same crop, and 250% than three centners of phosphorite powder as the main application.

The more intensive use of fertilizers must go along with a decrease in the cost of agricultural products. At the present, in kolkhoz-sovkhoz practice, and in financial-accounting documentation all fertilizers and expenditures for their use are regarded as the working capital of production, which wholly refer to the output of the first crop. At the same time most fertilizers also affect harvest yield increases for subsequent crops over the course of several years. In this connection, the cost of the produce of the first crop, under which fertilizer has been applied, is increased, but the cost of subsequent crops is reduced. Taking into account the length of action of most fertilizers, it would be justified to introduce a scale of expenditure distribution for the use of fertilizers over several years, according to how the fertilizers applied affect the harvest of subsequent crops and according to the corresponding transition of slow-acting fertilizers from the category of working capital to the category of capital investments, with a change in the source of their financing.

The conference developed and adopted expanded recommendations on more effective use of mineral fertilizers and on conducting experimental studies in this area in 1963.